

## **Historic, Archive Document**

Do not assume content reflects current scientific knowledge, policies, or practices.





Puerto Rico Agricultural Experiment Station  
of the  
United States Department of Agriculture

AGRICULTURAL NOTES

No. 70 PAGE 1

MAYAGUEZ, P. R.

MAY 15, 1936

NOTES CONCERNING INTERNAL PARASITES OF POULTRY IN PUERTO RICO

BY

ELOISE B. CRAM, ZOOLOGIST,  
ZOOLOGICAL DIVISION, BUREAU OF ANIMAL INDUSTRY  
UNITED STATES DEPARTMENT OF AGRICULTURE

SCOPE OF THE INVESTIGATIONS

EXAMINATIONS COVERED REPRESENTATIVE PARTS OF THE ISLAND:

DURING THE THREE-MONTH PERIOD, OCTOBER 7, 1935, TO JANUARY 9, 1936, AN INVESTIGATION WAS CONDUCTED TO DETERMINE THE KINDS OF PARASITES PRESENT IN POULTRY IN PUERTO RICO, THE SEVERITY OF PARASITIC INFESTATIONS, AND THEIR IMPORTANCE ECONOMICALLY; IN ADDITION, RESEARCH WAS INITIATED ON POULTRY PARASITES FOR THE PURPOSE OF DETERMINING POSSIBLE MEASURES OF CONTROL WHICH WOULD DIMINISH THE ECONOMIC LOSSES SUSTAINED AT PRESENT FROM DEATHS AND DISEASE.

NECROPSY EXAMINATIONS WERE MADE ON A TOTAL OF 103 CHICKENS, 65 OF WHICH REPRESENTED POST-MORTEM EXAMINATIONS OF VISCERA OBTAINED FROM RESTAURANTS AND HOSPITALS, AND 38 REPRESENTED POST-MORTEM EXAMINATIONS OF FOWLS OBTAINED DIRECTLY FROM POULTRY FARMS; 3 GUINEA FOWLS AND 4 TURKEYS ALSO WERE EXAMINED. ONE OR MORE VISITS WERE MADE TO 16 POULTRY FARMS IN VARIOUS PARTS OF THE ISLAND. UNTHRIFTY OR SICK CHICKENS, FREQUENTLY SUBMITTED BY THE OWNERS FOR EXAMINATION, WERE TRANSPORTED TO THE HEADQUARTER LABORATORIES AND EXAMINED BEFORE AND AFTER DEATH. MATERIAL WAS OBTAINED FROM THE DRY AREAS OF THE ISLAND FOR COMPARISON WITH THE WET AREAS.

VARIETY AND INTENSITY OF PARASITIC INFESTATIONS

MANY SPECIES OF ROUNDWORMS AND TAPEWORMS OCCUR IN PUERTO RICAN POULTRY:

POSSIBLY 13 OR 14 SPECIES OF ROUNDWORMS WERE FOUND; THE OCCURRENCE OF 12 SPECIES WAS DEFINITELY ESTABLISHED. THERE WERE FIVE DISTINCT SPECIES OF TAPEWORMS PARASITIC IN THE INTESTINES OF THE POULTRY EXAMINED. NO INSTANCE OF INFESTATION WITH FLUKES WAS OBSERVED.







OF THE COCCIDIA, ONLY EIMERIA TENELLA WAS OBSERVED, THIS SPECIES BEING PRESENT IN COMPARATIVELY LIGHT INFECTIONS IN YOUNG CHICKS.

OF THE ROUNDWORMS, A SPECIES OF TETRAMERES WAS FREQUENTLY PRESENT IN VERY LARGE NUMBERS IN THE GLANDULAR STOMACH, THE ORGAN BEING ENLARGED, ITS WALL GREATLY THICKENED, AND ITS LUMEN REDUCED IN SIZE. A SPECIES OF STRONGYLOIDES WAS VERY COMMON IN OCCURRENCE, OCCASIONALLY IN VERY HEAVY INFESTATIONS, THE WALL OF THE SMALL INTESTINE IN SOME SUCH CASES BEING THICKENED AND INELASTIC. DISPHARYNX SPIRALIS, FOUND IN GUINEA FOWLS AND CHICKENS, ALTHOUGH NOT OF COMMON OCCURRENCE IN CHICKENS, WAS SEEN IN SEVERAL INSTANCES IN MASSIVE INFESTATIONS, A LARGE PART OF THE MUCOSA OF THE GLANDULAR STOMACH BEING NECROTIC, WITH SLOUGHING ULCERATED AREAS WHERE THE WORMS WERE ATTACHED.

TAPEWORM INFESTATIONS WERE SEVERE:

THE TAPEWORM INFESTATIONS, ESPECIALLY THOSE WITH HYMENOLEPIS CANTANIANA, WERE EXTREMELY FREQUENT IN OCCURRENCE AND OFTEN OF GREAT INTENSITY.

INFLUENCE OF ENVIRONMENTAL FACTORS ON KINDS AND NUMBERS OF PARASITES

FOWLS RAISED ON WIRE-MESH FLOORS ABOVE GROUND ESCAPED HEAVY PARASITE INFECTIONS:

DIFFERENT METHODS OF REARING POULTRY, WHICH WERE OBSERVED, INCLUDED THE FOLLOWING: (A) FOWLS RANGING AT WILL, WITH NO PROVISION OF SHELTERS OR OF SPECIAL FEED; (B) FOWLS RANGING ON LIMITED AREA AND PROVIDED WITH A SMALL HOUSE OR OTHER SHELTER AND WITH SPECIAL FEED; (C) FOWLS REARED ON WIRE-MESH FLOORS, IN BROODER HOUSES, FOR SEVERAL MONTHS OF THEIR EARLY LIFE, THEN RELEASED TO RANGE ON THE GROUND OVER A LIMITED AREA; (D) FOWLS ON THE GROUND, CONFINED TO A SMALL AREA FOR SEVERAL MONTHS OF THEIR EARLY LIFE, THEN TRANSFERRED TO CAGES WITH WIRE MESH FLOORS, IN ATTEMPTS TO CHECK DISEASES WHICH HAD BECOME ESTABLISHED; (E) FOWLS REARED IN CAGES, WITH WIRE-MESH FLOORS, THROUGHOUT THEIR ENTIRE LIFE.

UNDER THESE WIDELY DIFFERENT SYSTEMS OF HANDLING POULTRY, THE OPPORTUNITIES FOR ACQUISITION OF PARASITIC INFESTATIONS MIGHT BE EXPECTED ALSO TO VARY WIDELY. THE FINDINGS WERE AS FOLLOWS:

CHICKENS WHICH HAD BEEN REARED ON WIRE MESH FLOORS, NEVER HAVING HAD ACCESS TO THE GROUND, WERE FREE OF PARASITES IN THE CASES EXAMINED, WITH ONE EXCEPTION; IN THE ONE CASE A FEW SPECIMENS OF ASCARIDIA GALLI, THE LARGE ROUNDWORM OF THE INTESTINE, WERE PRESENT.

FOWLS RAISED ON GROUND SHOWED HEAVY INFECTION:

DIFFERENCES IN THE LENGTH OF TIME THE CHICKENS HAD BEEN ON THE GROUND, AND DIFFERENCES IN THE SIZE OF THE AREA RANGED BY THEM, DID NOT SHOW SIGNIFICANT DIFFERENCES IN THE ASSOCIATED PARASITIC FAUNA; FOR INSTANCE, FOWLS WHICH HAD BEEN HELD ON WIRE FOR THE EARLY PART OF THEIR LIVES, THEN TURNED INTO RUNS ON THE GROUND, SHOWED A VARIETY OF PARASITES COMPARABLE TO THAT OF BIRDS WHICH HAD NOT HAD EARLY PROTECTION, INDICATING THAT NO APPRECIABLE AGE IMMUNITY HAD BEEN ACQUIRED; THE INTENSITY OF INFESTATION IN THESE CASES WAS ABOUT THE SAME AS THE AVERAGE INTENSITY OF OTHER CASES. AS REGARDS THE





INFLUENCE OF WEATHER, AND ESPECIALLY THAT OF THE AMOUNT OF RAINFALL, NO MARKEDLY SIGNIFICANT DIFFERENCES WERE NOTED IN DIFFERENT PARTS OF THE ISLAND.

IT IS POSSIBLE THAT THE INVESTIGATION WAS NOT SUFFICIENTLY EXTENSIVE IN SCOPE, AS REGARDS THE NUMBERS OF FOWLS EXAMINED OR THE LENGTH OF THE PERIOD INVOLVED, TO DISCERN SUCH DIFFERENCES, BUT IN THE SOUTH CENTRAL COASTAL AREA, WHICH AREA HAS THE LEAST RAINFALL, THE FINDING IN CHICKENS OF SEVERAL SPECIES OF ROUNDWORMS, INCLUDING THOSE WITH DIRECT AND WITH INDIRECT LIFE HISTORIES, AND OF AT LEAST FOUR SPECIES OF TAPEWORMS, INDICATED THAT THE POSSIBILITIES OF PARASITISM EXIST IN THIS DRIER AREA AS WELL AS IN THE WETTER AREAS.

### RESULTS ON RESEARCH PROBLEMS

#### SMALL INVERTEBRATES ARE FREQUENTLY INTERMEDIATE HOSTS FOR POULTRY PARASITES:

SINCE TO ESTABLISH EFFECTIVE CONTROL MEASURES, THE LIFE HISTORY OF A PARASITE MUST BE KNOWN, EXPERIMENTAL INVESTIGATIONS WERE CENTERED LARGELY ON DETERMINING THE LIFE HISTORIES OF THE MOST IMPORTANT OF THE PARASITES WHICH WERE FOUND. IN THE CASES OF ALL THE PARASITES WHICH WERE INVOLVED, INFORMATION ALONG THESE LINES WAS AVAILABLE AS THE RESULT OF PREVIOUS INVESTIGATIONS IN OTHER LOCALITIES BUT IT WAS DESIRED TO MAKE OBSERVATIONS UNDER LOCAL CONDITIONS IN PUERTO RICO.

ALL THE TAPEWORMS AND 2 OF THE 3 ROUNDWORMS WHICH APPEARED TO BE MOST INJURIOUS IN PUERTO RICAN CHICKENS WERE KNOWN TO PASS PART OF THEIR LIFE HISTORY IN AN INTERMEDIATE HOST, --ONE OR MORE KINDS OF SMALL INVERTEBRATES, --IN WHICH THE LARVAL STAGES OF THE PARASITE DEVELOPED, THE CHICKEN SUBSEQUENTLY BECOMING INFECTED BY EATING THE INTERMEDIATE HOST.

#### TAPEWORMS OF POULTRY OCCUR IN EARTHWORMS, LAND SNAILS AND DUNG BEETLES:

AS REGARDS THE TAPEWORMS, THERE WERE PRODUCED EXPERIMENTAL INFESTATIONS OF AN EARTHWORM SPECIES WITH ONE SPECIES OF TAPEWORM, AMOBOTAENIA SPHENOIDES, AND OF SMALL LAND SNAILS, SUBULINA OCTONA, WITH ANOTHER TAPEWORM, DAVAINEA PROGLOTTINA; IN ADDITION, THERE WERE FOUND NATURAL INFESTATIONS OF SMALL DUNG BEETLES, ATAENIUS STERCORATOR, WITH CYSTICERCIDS, THAT IS, THE LARVAL STAGES, OF A THIRD SPECIES OF TAPEWORM, HYMENOLEPIS CANTANIANA.

#### SMALL GROUND FAUNA MUST BE VIEWED AS SOURCE OF MASS INFECTIONS OF MANY POULTRY PARASITES:

AS REGARDS ROUNDWORMS, ONE OF THE POULTRY STOMACH WORMS, TETRAMERES SPECIES, WAS DEVELOPED EXPERIMENTALLY IN GRASSHOPPERS AS INTERMEDIATE HOSTS; SIMILAR ATTEMPTS TO INFECT THE WEST INDIAN MOLE CRICKET KNOWN LOCALLY AS THE CHANGA, COCKROACHES, CRICKETS, BEETLES AND SNAILS WERE UNSUCCESSFUL. THE OTHER SPECIES OF ROUNDWORM FOUND IN THE GLANDULAR STOMACH, DISPHARYNX SPIRALIS, WAS DEVELOPED EXPERIMENTALLY IN PILL BUGS, CUBARIS MURINA.

FOR THE COMMERCIAL POULTRY GROWER IN PUERTO RICO MOST OF THE NATURALLY OCCURRING SMALL FAUNA FOUND IN THE GROUND ENVIRONMENT WHERE POULTRY ARE RAISED, MUST BE VIEWED WITH SUSPICION.







ARTIFICIAL INOCULATION WITH ROUNDWORM RESULTED IN CHANGE OF LOCALIZED INFECTION:

EXPERIMENTS WERE CONDUCTED ON VARIOUS PHASES OF THE LIFE HISTORY OF THE SPECIES OF STRONGYLOIDES WHICH WAS FOUND OF COMMON OCCURRENCE. IN NATURE, THIS ROUNDWORM OCCURRED PRIMARILY IN THE ANTERIOR TWO-THIRDS OF THE SMALL INTESTINE OF CHICKENS; IN ONLY TWO INSTANCES WERE THE CECA FOUND TO BE INFESTED AND IN BOTH OF THOSE CASES THE ENTIRE LENGTH OF THE SMALL INTESTINE WAS HEAVILY INFESTED, AND A LIGHT INFESTATION OF THE CECA WAS ALSO PRESENT. IN EXPERIMENTAL INFESTATIONS, ON THE OTHER HAND, THE ROUNDWORMS OCCURRED EXCLUSIVELY IN THE CECA.

TESTS WERE MADE OF VARIOUS FACTORS WHICH WERE CONSIDERED AS OF POSSIBLE SIGNIFICANCE IN THIS DIFFERENCE OF LOCALIZATION OF THE PARASITES, AS FOLLOWS: THE EFFECT OF THE METHOD OF INFECTION, NAMELY, BY ORAL ADMINISTRATION, ON THE ONE HAND, AND BY SUBCUTANEOUS INOCULATION OF THE LARVAE, ON THE OTHER HAND; THE EFFECT OF SINGLE AND OF REPEATED INFECTIONS; THE EFFECT OF THE AGE OF THE CHICKENS AT THE TIME OF INFECTION, CHICKENS OF TWO AGE GROUPS, 1 TO 3 WEEKS AND 4 TO 5 MONTHS OLD, RESPECTIVELY, BEING USED; THE EFFECT OF THE AGE OF THE LARVAL ROUNDWORMS AT TIME OF INFECTION; AND THE EFFECT OF MULTIPLE PARASITISM. IN THE LAST CASE, EXPERIMENTAL INFESTATIONS WITH TWO SPECIES OF TAPEWORMS, HYMENOLEPIS CANTANIANA AND AMOEDOTAENIA SPHENOIDES, WHICH INFEST THE ANTERIOR PART OF THE SMALL INTESTINE, WERE ESTABLISHED PRIOR TO THE EXPERIMENTAL INFECTION WITH STRONGYLOIDES. IN ALL THESE CASES, HOWEVER, THE INFESTATION WITH STRONGYLOIDES WAS FOUND TO BE LOCALIZED EXCLUSIVELY IN THE CECA; NO EXPLANATION WAS FOUND FOR THE DISCREPANCY BETWEEN THE SITES OF NATURAL AND ARTIFICIAL INFESTATIONS.

RECOMMENDATIONS REGARDING POULTRY REARING IN PUERTO RICO

MANAGEMENT FACTORS CONSTITUTE PRINCIPAL METHOD OF PARASITE PREVENTION:

FROM THE OBSERVATIONS MADE IN THE COURSE OF THIS INVESTIGATION, IT WAS CONCLUDED THAT POULTRY PARASITES ARE PRESENT IN PUERTO RICO IN RELATIVELY LARGE NUMBERS, BOTH AS REGARDS NUMBER OF SPECIES AND NUMBER OF INDIVIDUALS, AND THAT THEY ARE OF CONSIDERABLE ECONOMIC IMPORTANCE IN RETARDING THE DEVELOPMENT OF CHICKENS AND IN CAUSING MORTALITY. MANAGEMENT FACTORS, ESPECIALLY THOSE WHICH WOULD INVOLVE THE INTRODUCTION OF AND THE PERPETUATION OF PARASITIC INFESTATIONS, ARE OF PRIMARY IMPORTANCE IN THE SUCCESS OR FAILURE OF THE INDIVIDUAL FLOCK-OWNER AND ATTENTION CAN PROFITABLY BE DIRECTED TOWARD MEASURES TO PREVENT THE INTRODUCTION OF POULTRY PARASITES AND TO CHECK AND ELIMINATE PARASITES WHICH ALREADY HAVE BEEN INTRODUCED INTO A FLOCK.

GOOD DRAINAGE AND EXPOSURE OF RUNS TO SUNLIGHT ARE RECOMMENDED TO REDUCE PARASITE POPULATION:

SUCH MEASURES AS THE SELECTION OF A SITE NOT PREVIOUSLY USED FOR POULTRY, HAVING GOOD DRAINAGE AND EXPOSED TO SUNLIGHT, AND THE USE OF INCUBATOR-HATCHED, BROODER-REARED CHICKENS AS THE BASIS OF THE FLOCK, WITH NO INTRODUCTION OF FOWLS WHICH MIGHT BE SOURCES OF INFECTION, ARE TO BE RECOMMENDED TO THOSE STARTING IN THE BUSINESS.

FOR THOSE POULTRYMEN WHO NOW HAVE FLOCKS OF INFESTED FOWLS, AND AREAS BADLY CONTAMINATED WITH POULTRY PARASITES, STARTING ANEW ON THAT AREA WITH THE USE OF BATTERIES OF CAGES HAVING WIRE-MESH FLOORS HAS PROVED EFFECTIVE IN CHECKING AND PRACTICALLY ELIMINATING THE PARASITES. THAT LESS RADICAL METHODS MAY BE EFFECTIVE IN







THIS RESPECT HAS NOT BEEN GIVEN A CRITICAL TEST, AND IT IS HIGHLY DESIRABLE THAT VARIOUS CONTROL MEASURES BE CRITICALLY EVALUATED, EITHER BY A GOVERNMENT AGENCY OR PRIVATE INDIVIDUALS. ROTATION OF RANGES, SO THAT A PREVIOUSLY USED RANGE WOULD STAND IDLE, OR BE PUT TO OTHER USE THAN THAT FOR POULTRY, THROUGHOUT A DRY SEASON, BEFORE AGAIN BEING USED FOR POULTRY, SHOULD BE GIVEN CRITICAL TESTING. COMPLETE ELIMINATION OF NATURAL SHADE, AND PROVISION OF ARTIFICIAL, MOVABLE SHADE, SO ARRANGED THAT ALL PARTS OF THE RANGE ARE EXPOSED DAILY TO WHATEVER SUNLIGHT IS AVAILABLE, IS ANOTHER FACTOR WHICH MAY BE UTILIZED TO REDUCE THE POPULATION OF PARASITES. FEED AND WATER CONTAINERS ARRANGED ON SUPPORTS ABOVE THE GROUND IN SUCH A WAY THAT THERE ARE NO DAMP SHADED AREAS CONDUCTIVE TO THE DEVELOPMENT OF PARASITES OR OF INTERMEDIATE HOSTS OF PARASITES, AND OTHER MEASURES OF A SIMILAR NATURE, MAY PROVE OF VALUE IN LESSENING MASS INFECTION.

